**Figure 1:**

Amino acid sequences of Cpn60 and Cpn10:

SEQ ID No 1: Cpn10 (encoded by nucleotides pos. 458-751 of Figure 2):

MKIRPLHDRIVVRRKEEETATAGGIILPGAAAEKPNQGVVISVGTGRILDNGSVQALA
VNEGDVVVFGKYSGQNTIDIDGEELLILNESDIYGVLEA

SEQ ID No 2: Cpn60 (encoded by nucleotides pos. 800-2446 of Figure 2):

MAAKDVLFGDSARAKMLVGVNILADAVRVTLGPKGRNVVIEKSFGAPIITKDGVSV
AREIELKDKFENMGAQMVKEVASQANDQAGDGTTTATVLAQAIISEGLKSVAAGMN
PMDLKRGIDKATAAVVAAIKEQAQPCLDTKAIAQVGTISANADETVGRLIAEAMEKV
GKEGVITVEEGKGLEDELDVVEGMQFDRGYLSPYFINNQEKMTVEMENPLILLVDKK
IDNLQELLPILENVAKSGRPLLIVAEDVEGQALATLVVNNLRGTFKVAAVKAPGFGD
RRKAMLQDLAILTGGQVISEELGMSLETADPSSLGTASKVVIDKENTVIVDGAGTEAS
VNTRVDQIRAEIESSTSDYDIEKLQERVAKLAGGVAVIKVGAGSEMEMKEKKDRVD
DALHATRAAVEEGVVAGGGVALIRALSSVTVVGDNEDQNVGIALALRAMEAPIRQI
AGNAGAEGSVVVDKVKSGTGSFGFNASTGEYGDMIAMGILDPAKVTRSSLQAAASI
AGLMITTEAMVADAPVEEGAGGMPDMGGMGGMGGMPGMM

**Figure 2:**

SEQ ID No 3: DNA coding for Cpn60 and Cpn10:

Cpn10, pos. 458-751

Cpn60, pos. 800-2446

atcaaaaaatgcagcaaggacagattcctgcccaagaattagcagaaggtttcttgttagcactggccggcgctttattattaacgccgg
gttttgtcactgatgcgctgggttttacattactcgtccccgcgacgcgtaaagcgttggtccataaggtgattgcatttattacccctc
gcatgatgactgcaagcagctttcaagcgacgggtagttttcaggaaggctcgtttaaagatgtacattcgcacactgactcgcaaagca
gtcatgaaaaaatcacaattgaaggcgaatataccaaagacgataagtaggtatttttttcggctagccgttgaaatcctagtaaaagccc
cgataaattaaccatctatttttcacagaggcaatttagcctttgtttaccttattgatcctaatacttgggatccaacagttggagagtctagc
aaatgaaaatccgtccattacatgatcgtattgttgttcgccgtaaagaagaagagaccgcaactgcgggtggtattattttacc
gggcgctgcggcagaaaaaccaaatcaaggtgttgttatctctgtgggtactggccgtattcttgataatggttcagtgcaagcgctggc
ggttaacgaaggcgatgttgtcgttttttggtaaatactcaggtcaaaatactatcgatatcgatggtgaagaattattgatttttgaatga
aagtgatatctacggcgttttagaagcttaattattacactcacttttttatttaacctacaaaatttaaggaaagatcatggctgctaaagacg
tattatttggtgatagcgcacgcgcaaaaatgttggtaggtgtaaacatttttagccgacgcagtaagagttaccttaggacctaa
aggtcgtaacgttgttatagaaaaatcatttggtgcaccgatcatcaccaaagatggtgtttctgttgcgcgtgaaatcgaattgaaagaca
aattcgaaaacatgggcgcacagatggttaaggaagttgcttctcaagccaacgaccaagccggtgacggcacaacgacagcgact
gtactagcacaggcgattatcagcgaaggcttgaaatctgttgcggctggcatgaatccaatggatcttaaacgtggtattgataaagcta
cggctgctgttgttgccgccattaaagaacaagctcagccttgcttggatacaaaagcaatcgctcaggtagggacaatctctgccaatg
ccgatgaaacggttggtcgtttaattgctgaagcgatggaaaaagtcggtaaagaaggtgtgattaccgttgaagaaggcaaaggcctt
gaagacgagcttgatgttgtagaaggcatgcagttcgatcgcggttacttgtctccgtacttcatcaacaaccaagaaaaaatgaccgta
gaaatggaaaatccattaatictattggttgataagaaaattgataaccttcaagagctgttgccaattcttgaaaacgtcgctaaatcaggt
cgtccattattgatcgttgctgaagatgttgaaggccaagcactagcaacattggtagtaaacaacttgcgcggcacattcaaggttgc
agcggttaaagcccctggttttggcgatcgtcgtaaagcgatgttgcaagatcttgccatcttgacgggtggtcaggttatttctgaagag
ctagggatgtctttagaaactgcggatccttcttcttgggtacggcaagcaaggttgttatcgataaagaaaacaccgtgattgttga
tggcgcaggtactgaagcaagcgttaatactcgtgttgaccagatccgtgctgaaatcgaaagctcgacttctgattacgacatcgaaaa
gttacaagaacgcgttgctaagcttgcgggcggcgttgccgtgattaaggttggtgcgggttctgaaatggaaatgaaagagaagaaa
gaccgtgttgacgatgcacttcatgcaactcgcgcagcggttgaagaaggtgttgttgcgggtggtggtgttgctttgattcgcgcactct
cticagtaacgttgttggtgataacgaagatcaaaacgtcggtattgcattggcacttcgtgcgatggaagctcctatccgtcaaatcgc
gggtaacgcaggtgctgaagggtcagtggttgttgataaagtgaaatctggcacaggtagctttggttttaacgccagcacaggtgagt
atggcgatatgattgcgatgggtattttagaccctgcaaaagtcacgcgttcatctctacaagccgcggcgtctatcgcaggtttgatgat

cacaaccgaagccatggttgcggatgcgcctgttgaagaaggcgctggtggtatgcctgatatgggcggcatgggtggaatgggcg
gtatgcctggcatgatgtaatcactttgtgattcattgtcctgatctgcttaccgtgtaaaaagatcaggctcaaggctgtctctataaaaag
ccgtatcttgatgagtgttgtctttctgctgaaaacgacattcttggagtgcggctttttttgattttggtcataaaattcagaatattgtgtaatt
ttatgtaactagctggcctataatgttgagttcctctgggtggcatgatctcatggtacttcacttaagcctgattcactgcg
gctttaacagtaaaataataacgcaacgtagaaacataataagcgtatggcattaatgaagacggctgcatttaattcagatc

**Figure 3:**

SEQ ID No 4: Amino acid sequence of esterase cloned from *Oleispira antarctica* (EstRB8):

EstRB8 (encoded by nucleotides 1145 to 2143 Frame 2 of Figure 4) 333 aa
MKNTLKSSSRFSLKQLGTGALIISSLFFGGCTTTQQDNLYTGVMSLARDSAGLEVKTA
SAGDVNLTYMERQGSDKDNAESVILLHGFSADKDNWILFTKEFDEKYHVIAVDLAG
HGDSEQLLTTDYGLIKQAERLDIFLSGLGVNSFHIAGNSMGGAISAIYSLSHPEKVKSL
TLIDAAGVDGDTESEYYKVLAEGKNPLIATDEASFEYRMGFTMTQPPFLPWPLRPSLL
RKTLARAEINNKIFSDMLKTKERLGMTNFQQKIEVKMAQHPLPTLIMWGKEDRVLD
VSAAAAFKKIIPQATVHIFPEVGHLPMVEIPSESAKVYEEFLSSIK

**Figure 4:**

SEQ ID No 5: DNA fragment from plasmid pBK1Est coding for esterase of *Oleispira antarctica* (EstRB8):

Nucleotide positions 1-100 correspond to reverse complement of positions 1196-1121 and 3799-3939 correspond to reverse complement of 1043-952 of pBK-CMV vector (Stratagene).

Positions 101-105 are *BamH*I – *Sau*3A1 fusion and positions 3795-3798 are *Sau*3A1-*Bam*HI-fusion.

acaggaaacagctatgaccttgattacgccaagctcgaaattaaccctcactaaagggaacaaaagctggagctgcgcgcctgcag
gtcgacactagtggatcaacggcgttcatggtactggctgagttcagcgtcataatgccgatgcgatactggccgtcatgactgagtact
tcttctgctagcaccgatttttctaatagcgcagcttcttttattctgaacgggcaactgatgtagttttttactaaccggctttttaggcatgg
taaactcttcgatattcaaaattattactgttcatattacaatcatagtacaggctagaggcccaaaattgcagctgatattcacctttattattc
taagcattattacactcatcgcggtgttattaattgtgctaaataaaaataccctagcggaaaaattcagcaaatagccaaagaaaacga
ttggcaataccaagaattcatcgattttgatgatgacattaagcaggcaaactttggcctattaaactacagtcaaaatgcaatttttagacat
ctcattcaagcaactgacgaacactatggcttagcgtttaagacctttgactgtcgagcgttagaaccttcaggtattcacaatagcagtct
tattttatttaccctcgcactaaagactgaattcaataacctacacatttgcttaagtcgacatattcaagataaagatgccttcactgacatca
gtcaccaacaatcaatcaaacaccaataccaatcgcaaaaactcataaaactagccgatcaccaaatcccaaaagcgttcaaaaatgaa
acgagcacgtcacacaaaatcaatttatacgctaacgaaccaggtcaaacttatcgttttttgagcacgtttgttccactaatgaaagaga
aaagtcgttaattcactggcttttggcgtatccgcaccttcacatagaaattagtaatggcatgctactggcctttaaaaagaatcagttaatt
gaagaaacctcgcttatctcagccattacccgctgtagccgaatttgcgcttatcctcagccatgattaaactgacgccaattaatataagac
atactaattaataactccttaattgagaagaataatgaaaaacacactcaaatcctcatcacgtttagtctgaaacaactcggcaccggc
gctctgattatctccagtttgttcttcggtggttgcaccacaacacaacaagataatttatacacaggggttatgtctcttgcgagagacagc
gctggcctagaagttaaaacagcctctgccggtgacgtcaatcttacttatatggaacgccaaggcagtgacaaagataatgccgaaag
cgttattttattacacggtttctctgctgataaagataactggattcttttttaccaaagaattcgatgaaaaatatcatgttatcgctgtcgattta
gcgggacatggcgattcagaacaattattaacgactgattacggtctcataaaacaagccgagcgtttagatatcttcttatctggcttagg
ggttaactcatttcacatcgccggtaattcaatgggggggggctatcagcgcaatctacagtttgagtcacccagagaaagttaaaagtctt
acattgatcgatgcagcaggtgtcgatggcgatactgaaagcgaatactacaaagttttggcagaaggtaagaatcctttaattgcaact
gatgaagcaagttttgaatacccgcatgggttcaccatgactcagcctccttttcctaccttggccactaagaccttcttttattacgtaaaacg
ctagcccgtgccgagatcaataacaaaattttttccgatatgctgaaaaccaaagaacgtttaggaatgactaactttcaacagaaaattg
aagtgaaaatggctcaacatccattgccaacactgattatgtggggcaaagaagatcgcgttcttgacgtatccgcagcagcggccttc
aaaaaaataattccacaagcaactgttcatatttttcctgaagtaggccacctacctatggtagaaattcctagtgaaagcgctaaagtttat

gaagagttttgtcctctattaaataagagcacataatcatgactgacttataaacagccaagcatttaaaatgcttggctgtttatttttaatgg
ccaaaattattcaacgaccaagctctgcggtaaaatcgcagtgggtttcttgttttcatcaacagcaacaaacgtgaaatacccccgtaatcg
catttttctgattatcaaaatacatactttccaccagcatattaacttcaacttttaaaactcgtccgccctaccctctataacactggcagtcaatt
cgacaatggtaccctgcgggaacaggatgcttaaaatcgattcgatcactgctgacggttacgatgctttgtcgagaaaaacgagtcgct
gcaataaaagaaacctcatccatccactgcattgcagtgccaccgaataacgtatcatgatgatttgttgtctctggaaataccgctttaga
aatagtggtttttgatacgcgctttcgctgcgcaataatatcttctctgctaagagttgcggatggcatacataaactcgcttgattaagatta
ataataaatagttaacagtatattgaactgagggtctgaagaactctaatacctctgaagaacttgaggccgctagagagaaaagacca
gtgataatatttcatcttgccatgagagcttatcatgaaagcctgtgcttaaaatcaatcattatatttattcatctttaattgaaataataccaat
atatttcatatataatttcacactacccttatctcactagacttcccgcgcataggcgcaaacaatcaacgcaagttcacaataaagcggttc
gctgcaacacatgccctagcgtctaaagtagcacgcacaacactggccagtcgtactagccccttgcgattcgtgcagacgagcaac
aagcgctattaaacttacctaaatttctaaccaccaccattggttcttttccacaaactcaaaaaactcgtcaaatccgcttgcaatttaaacg
cgatgacatagatctaatcgattatcaaaccccgcattcaagcgctcattaaaaacgcaccactggcaagaagttctacctgcactgacca
atatgcaagcggcggcggaagagctgcctttgatcgatcaagaagaagggagcagcaaagaggaaaacaatcaaaaagaggaga
gcaatcaaataaaaacgagttattgaggatttaatttaaaacaggtatattaataccctctctcgtagtaaacaatgactgtatttacacaa
aaataaatagaggtataccatgtcaaacatctggtttgaagtaccaaagattgaagtattaaaccgtcaaatggaaaatactgcctgcagc
aacttaggcattcaaattacagaaattggcgatgattatatcactggcacaatgccagcagatgcacgtaccttccagccaatgggactg
atttcatggcggctcaaatgtattgctggcagaaacactgggcagcatggcagctaactgctgtattaatttgtctcaagaatattgtgttgg
ccaagaaattaacgccaaccacatacgcggtgttcgttccggcatagtgactggcacagcaacgctagtacacaaaggaagaacctc
ccagatttgggaaattcgcatcgttaacgatccaaagaattcaaaaagcttctcgagagtacttctagagcggccgcgggcccatcgatt
ttccaccccgggtggggtaccaggtaagtgtacccaattcgccctatagtgagtcgtattacaattcactggccgtcgtttac

**Figure 5:**

Amino acid sequences expressed from vector pBK1CpnEst: - the co-expression of fragments encoding native chaperonines with the esterase gene (EstRB8), all from *Oleispira antarctica*

SEQ ID No 6: cpn10 (nucleotides 113 to 403: Frame 2 of Figure 6) 97 aa:

MKIRPLHDRIVVRRKEEETATAGGIILPGAAAEKPNQGVVISVGTGRILDNGSVQALA
VNEGDVVVFGKYSGQNTIDIDGEELLILNESDIYGVLEA

SEQ ID No 7: cpn60 (nucleotides 455 to 2098: Frame 2 of Figure 6) 548 aa:

MAAKDVLFGDSARAKMLVGVNILADAVRVTLGPKGRNVVIEKSFGAPIITKDGVSV
AREIELKDKFENMGAQMVKEVASQANDQAGDGTTTATVLAQAIISEGLKSVAAGMN
PMDLKRGIDKATAAVVAAIKEQAQPCLDTKAIAQVGTISANADETVGRLIAEAMEKV
GKEGVITVEEGKGLEDELDVVEGMQFDRGYLSPYFINNQEKMTVEMENPLILLVDKK
IDNLQELLPILENVAKSGRPLLIVAEDVEGQALATLVVNNLRGTFKVAAVKAPGFGD
RRKAMLQDLAILTGGQVISEELGMSLETADPSSLGTASKVVIDKENTVIVDGAGTEAS
VNTRVDQIRAEIESSTSDYDIEKLQERVAKLAGGVAVIKVGAGSEMEMKEKKDRVD
DALHATRAAVEEGVVAGGGVALIRALSSVTVVGDNEDQNVGIALALRAMEAPIRQI
AGNAGAEGSVVVDKVKSGTGSFGFNASTGEYGDMIAMGILDPAKVTRSSLQAAASI
AGLMITTEAMVADAPVEEGAGGMPDMGGMGGMGGMPGMM

SEQ ID No 8: estRB8 (nucleotides 2579 to 3577: Frame 2 of Figure 6) 333 aa:

MKNTLKSSSRFSLKQLGTGALIISSLFFGGCTTTQQDNLYTGVMSLARDSAGLEVKTA
SAGDVNLTYMERQGSDKDNAESVILLHGFSADKDNWILFTKEFDEKYHVIAVDLAG
HGDSEQLLTTDYGLIKQAERLDIFLSGLGVNSFHIAGNSMGGAISAIYSLSHPEKVKSL
TLIDAAGVDGDTESEYYKVLAEGKNPLIATDEASFEYRMGFTMTQPPFLPWPLRPSLL
RKTLARAEINNKIFSDMLKTKERLGMTNFQQKIEVKMAQHPLPTLIMWGKEDRVLD
VSAAAAFKKIIPQATVHIFPEVGHLPMVEIPSESAKVYEEFLSSIK

**Figure 6:**

SEQ ID No 9: pBK1CpnEst: - the fusion of native chaperonine-coding fragments with esterase of *Oleispira antarctica* (EstRB8)

The DNA fragment coding for Cpn10 and Cpn60 is flanked by *Sac*I site (pos. 69-75) and *Sal*I site (encoded by pos. 2138-2143 of Figure 7):

Nucleotide positions 1-75 correspond to reverse complement of positions 1196-1121 and positions 5233-5273 correspond to reverse complement of 1043-952 of pBK-CMV vector (Stratagene)

Small letters – the Cpn10-Cpn60 encoding fragment,
Capital italics – fragments of vector pBK-CMV
Capital letters – fragment coding for EstRB8 from plasmid pBK1Est

*ACAGGAAACAGCTATGACCTTGATTACGCCAAGCTCGAAATTAACCCTCACTAAAGGGA*
*ACAAAAGCTGGAGCTC*ctaatacttgggatccaacagttggagagtctagcaaatgaaaatccgtccattacatgatcgtatt
gttgttcgccgtaaagaagaagagaccgcaactgcgggtggtattatttttaccgggcgctgcggcagaaaaaccaaatcaaggtgttgt
tatctctgtgggtactggccgtattcttgataatggttcagtgcaagcgctggcggttaacgaaggcgatgttgtcgttttggtaaatactc
aggtcaaaatactatcgatatcgatggtgaagaattattgatttttgaatgaaagtgatatctacggcgttttagaagcttaattattacactca
ctttttatttaacctacaaaatttaaggaaagatcatggctgctaaagacgtattatttggtgatagcgcacgcgcaaaaatgttggtaggt
gtaaacattttagccgacgcagtaagagttaccttaggacctaaaggtcgtaacgttgttatagaaaaatcatttggtgcaccgatcatcac
caaagatggtgtttctgttgcgcgtgaaatcgaattgaaagacaaattcgaaaacatgggcgcacagatggttaaggaagttgcttctca
agccaacgaccaagccggtgacggcacaacgacagcgactgtactagcacaggcgattatcagcgaaggcttgaaatctgttgcgg
ctggcatgaatccaatggatcttaaacgtggtattgataaagctacggctgctgttgttgccgccattaaagaacaagctcagccttgcttg
gatacaaaagcaatcgctcaggtagggacaatctctgccaatgccgatgaaacggttggtcgtttaattgctgaagcgatggaaaaagt
cggtaaagaaggtgtgattaccgttgaagaaggcaaaggccttgaagacgagcttgatgttgtagaaggcatgcagttcgatcgcggtt
acttgtctccgtacttcatcaacaaccaagaaaaaatgaccgtagaaatggaaaatccattaattctattggttgataagaaaattgataac
cttcaagagctgttgccaattcttgaaaacgtcgctaaatcaggtcgtccattattgatcgttgctgaagatgttgaaggccaagcactagc
aacattggtagtaaacaactgcgcggcacattcaaggttgcagcggttaaagcccctggttttggcgatcgtcgtaaagcgatgttgca
agatcttgccatcttgacgggtggtcaggttatttctgaagagctagggatgtctttagaaactgcggatccttcttctttgggtacggcaa
gcaaggttgttatcgataaagaaaacaccgtgattgttgatggcgcaggtactgaagcaagcgttaatactcgtgttgaccagatccgtg
ctgaaatcgaaagctcgacttctgattacgacatcgaaaagttacaagaacgcgttgctaagcttgcgggcggcgttgccgtgattaag

gttggtgcgggttctgaaatggaaatgaaagagaagaaagaccgtgttgacgatgcacttcatgcaactcgcgcagcggttgaagaag
gtgttgttgcgggtggtggtgttgctttgattcgcgcactcttcagtaaccgttgttggtgataacgaagatcaaaacgtcggtattgcat
tggcacttcgtgcgatggaagctcctatccgtcaaatcgcgggtaacgcaggtgctgaagggtcagtggttgttgataaagtgaaatctg
gcacaggtagcttggttttaacgccagcacaggtgagtatggcgatatgattgcgatgggtattttagaccctgcaaaagtcacgcgttc
atctctacaagccgcggcgtctatcgcaggtttgatgatcacaaccgaagccatggttgcggatgcgcctgttgaagaaggcgctggtg
gtatgcctgatatgggcggcatgggtggaatgggcggtatgcctggcatgatgtaatcactttgtgattcattgtcctgatctgcttaccgt
GTCGACATATTCAAGATAAAGATGCCTTCACTGACATCAGTCACCAACAATCAAT
CAAACACCAATACCAATCGCAAAAACTCATAAAACTAGCCGATCACCAAATCCC
AAAAGCGTTCAAAAATGAAACGAGCACGTCACACAAAATCAATTTATACGCTAA
CGAACCAGGTCAAACTTATCGTTTTTTTGAGCACGTTTGTTCCACTAATGAAAGA
GAAAAGTCGTTAATTCACTGGCTTTTGGCGTATCCGCACCTTCACATAGAAATTA
GTAATGGCATGCTACTGGCCTTTAAAAAGAATCAGTTAATTGAAGAAACCTCGCT
TATCTCAGCCATTACCGCTGTAGCCGAATTTGCGCTTATCCTCAGCCATGATTAAA
CTGACGCCAATTAATATAAGACATACTAATTAATAACTCCCTTAATTGAGAAGAA
TAATGAAAAACACACTCAAATCCTCATCACGTTTTAGTCTGAAACAACTCGGCAC
CGGCGCTCTGATTATCTCCAGTTTGTTCTTCGGTGGTTGCACCACAACACAACAAG
ATAATTTATACACAGGGGTTATGTCTCTTGCGAGAGACAGCGCTGGCCTAGAAGT
TAAAACAGCCTCTGCCGGTGACGTCAATCTTACTTATATGGAACGCCAAGGCAGT
GACAAAGATAATGCCGAAAGCGTTATTTTATTACACGGTTTCTCTGCTGATAAAG
ATAACTGGATTCTTTTTACCAAAGAATTCGATGAAAAATATCATGTTATCGCTGTC
GATTTAGCGGGACATGGCGATTCAGAACAATTATTAACGACTGATTACGGTCTCA
TAAAACAAGCCGAGCGTTTAGATATCTTCTTATCTGGCTTAGGGGTTAACTCATTT
CACATCGCCGGTAATTCAATGGGGGGGGCTATCAGCGCAATCTACAGTTTGAGTC
ACCCAGAGAAAGTTAAAAGTCTTACATTGATCGATGCAGCAGGTGTCGATGGCG
ATACTGAAAGCGAATACTACAAAGTTTTGGCAGAAGGTAAGAATCCTTTAATTGC
AACTGATGAAGCAAGTTTTGAATACCGCATGGGTTTCACCATGACTCAGCCTCCT
TTCCTACCTTGGCCACTAAGACCTTCTTTATTACGTAAAACGCTAGCCCGTGCCGA
GATCAATAACAAAATTTTTTCCGATATGCTGAAAACCAAAGAACGTTTAGGAATG
ACTAACTTTCAACAGAAAATTGAAGTGAAAATGGCTCAACATCCATTGCCAACAC
TGATTATGTGGGGCAAAGAAGATCGCGTTCTTGACGTATCCGCAGCAGCGGCCTT
CAAAAAAATAATTCCACAAGCAACTGTTCATATTTTTCCTGAAGTAGGCCACCTA
CCTATGGTAGAAATTCCTAGTGAAAGCGCTAAAGTTTATGAAGAGTTTTTGTCCT
CTATTAAATAAGAGCACATAATCATGACTGACTTATAAACAGCCAAGCATTTAAA
ATGCTTGGCTGTTTATTTTAATGGCCAAATTATTCAACGACCAAGCTCTGCGGTAA

AATCGCAGTGGGTTTCTTGTTTTCATCAACAGCAACAAACGTGAAATACCCCGTA
ATCGCATTTTTCTGATTATCAAAATACATACTTTCCACCAGCATATTAACTTCAAC
TTTTAAACTCGTCCGCCCTACCTCTATAACACTGGCAGTCAATTCGACAATGGTAC
CTGCGGGAACAGGATGCTTAAAATCGATTCGATCACTGCTGACGGTTACGATGCT
TTGTCGAGAAAAACGAGTCGCTGCAATAAAAGAAACCTCATCCATCCACTGCATT
GCAGTGCCACCGAATAACGTATCATGATGATTTGTTGTCTCTGGAAATACCGCTTT
AGAAATAGTGGTTTTTGATACGCGCTTTCGCTGCGCAATAATATCTTCTCTGCTAA
GAGTTGCGGATGGCATACATAAACTCGCTTGATTAAGATTAATAATAAATAGTTA
ACAGTATATTGAACTGAGGGTCTGAAGAACTCTAATACCTCTGAAGAACTTTGAG
GCCGCTAGAGAGAAAAGACCAGTGATAATATTTCATCTTGCCATGAGAGCTTATC
ATGAAAGCCTGTGCTTAAAATCAATCATTATATTTATTCATCTTTAATTGAAATAA
TACCAATATATTTCATATATAATTTCACACTACCCTTATCTCACTAGACTTCCCGC
GCATAGGCGCAAACAATCAACGCAAGTTCACAATAAAGCGGTTCGCTGCAACAC
ATGCCCTAGCGTCTAAAGTAGCACGCACAACACTGGCCAGTCGTACTAGCCCCTT
TGCGATTCGTGCAGACGAGCAACAAGCGCTATTAAACTTACCTAAATTTCTAACC
ACCACCATTGGTTCTTTTCCACAAACTCAAAAAACTCGTCAAATCCGCTTGCAATT
TAAACGCGATGACATAGATCTAATCGATTATCAAACCCGCATTCAAGCGCTCATT
AAAAACGCACCACTGGCAAGAAGTTCTACCTGCACTGACCAATATGCAAGCGGC
GGCGGAAGAGCTGCCTTTGATCGATCAAGAAGAAGGGAGCAGCAAAGAGGAAA
ACAATCAAAAAGAGGAGAGCAATCAAATAAAAACGAGTTATTGAGGATTTTAAT
TTTAAAACAGGTATATTAATACCCTCTCTCGTAGTAAACAATGACTGTATTTACAC
AAAAATAAATAGAGGTATACCATGTCAAACATCTGGTTTGAAGTACCAAAGATTG
AAGTATTAAACCGTCAAATGGAAAATACTGCCTGCAGCAACTTAGGCATTCAAAT
TACAGAAATTGGCGATGATTATATCACTGGCACAATGCCAGCAGATGCACGTACC
TTCCAGCCAATGGGACTGATTCATGGCGGCTCAAATGTATTGCTGGCAGAAACAC
TGGGCAGCATGGCAGCTAACTGCTGTATTAATTTGTCTCAAGAATATTGTGTTGG
CCAAGAAATTAACGCCAACCACATACGCGGTGTTCGTTCCGGCATAGTGACTGGC
ACAGCAACGCTAGTACACAAAGGAAGAACCTCCCAGATTTGGGAAATTCGCATC
GTTAAC*GATCCAAAGAATTCAAAAAGCTTCTCGAGAGTACTTCTAGAGCGGCCGCGGG*
*CCCATCGATTTTCCACCCGGGTGGGGTACCAGGTAAGTGTACCCAATTCGCCCTATAGT*
*GAGTCGTATTACAATTCACTGGCCGTCGTTTTAC*

**Figure 7:**

Amino acid sequences expressed from vector pBK1CpnSREst: - the co-expression of the stabilized single ring mutant chaperonin with the esterase gene (EstRB8) from *Oleispira antarctica* (cpn10::stabilized single ring mutant Glu460Ala/Ser462Ala/Val463Ala::est)

SEQ ID No 10: cpn10 (nucleotides 113 to 403: Frame 2 of Figure 8) 97 aa:

MKIRPLHDRIVVRRKEEETATAGGIILPGAAAEKPNQGVVISVGTGRILDNGSVQALA
VNEGDVVVFGKYSGQNTIDIDGEELLILNESDIYGVLEA

Below – ***Capital bold letters*** are the mutations introduced

SEQ ID No 11: stabilized single ring mutant of cpn60 (nucleotides 455 to 2098: Frame 2 of Figure 8) 548 aa:

MAAKDVLFGDSARAKMLVGVNILADAVRVTLGPKGRNVVIEKSFGAPIITKDGVSV
AREIELKDKFENMGAQMVKEVASQANDQAGDGTTTATVLAQAIISEGLKSVAAGMN
PMDLKRGIDKATAAVVAAIKEQAQPCLDTKAIAQVGTISANADETVGRLIAEAMEKV
GKEGVITVEEGKGLEDELDVVEGMQFDRGYLSPYFINNQEKMTVEMENPLILLVDKK
IDNLQELLPILENVAKSGRPLLIVAEDVEGQALATLVVNNLRGTFKVAAVKAPGFGD
RRKAMLQDLAILTGGQVISEELGMSLETADPSSLGTASKVVIDKENTVIVDGAGTEAS
VNTRVDQIRAEIESSTSDYDIEKLQERVAKLAGGVAVIKVGAGSEMEMKEKKDRVD
DALHATRAAVEEGVVAGGGVALIRALSSVTVVGDNEDQNVGIALALRAMEAPIRQI
AGNAGA*AG**AA*VVDKVKSGTGSFGFNASTGEYGDMIAMGILDPAKVTRSSLQAAASI
AGLMITTEAMVADAPVEEGAGGMPDMGGMGGMGGMPGMM

SEQ ID No 12: EstRB8 (nucleotides 2579 to 3577: Frame 2 of Figure 8) 333 aa:

MKNTLKSSSRFSLKQLGTGALIISSLFFGGCTTTQQDNLYTGVMSLARDSAGLEVKTA
SAGDVNLTYMERQGSDKDNAESVILLHGFSADKDNWILFTKEFDEKYHVIAVDLAG
HGDSEQLLTTDYGLIKQAERLDIFLSGLGVNSFHIAGNSMGGAISAIYSLSHPEKVKSL
TLIDAAGVDGDTESEYYKVLAEGKNPLIATDEASFEYRMGFTMTQPPFLPWPLRPSLL

RKTLARAEINNKIFSDMLKTKERLGMTNFQQKIEVKMAQHPLPTLIMWGKEDRVLD

VSAAAAFKKIIPQATVHIFPEVGHLPMVEIPSESAKVYEEFLSSIK

**Figure 8:**

SEQ ID No 13: DNA sequence of vector pBK1CpnSREst: the expression cassette for the co-expression of the stabilized single ring mutant chaperonin with the esterase gene (EstRB8) from *Oleispira antarctica* (cpn10::stabilized single ring mutant Glu460Ala/Ser462Ala/Val463Ala::est)

Nucleotide positions 1-75 correspond to reverse complement of positions 1196-1121 and positions 5233-5273 correspond to reverse complement of 1043-952 of pBK-CMV vector (Stratagene)

DNA fragment coding for Cpn10 and Cpn60 is flanked by *Sac*I site (pos. 69-75) and *Sal*I site (pos. 2138-2143).

In the DNA sequence:
Small letters – the Cpn10-Cpn60 coding fragment,
Capital italics – fragments of vector
Capital letters – fragment coding for EstRB8 from plasmid pBK1Est
Capital bold letters = introduced mutations

*ACAGGAAACAGCTATGACCTTGATTACGCCAAGCTCGAAATTAACCCTCACTAAAGGGA ACAAAAGCTGGAGCTC*ctaatacttgggatccaacagttggagagtctagcaaatgaaaatccgtccattacatgatcgtatt gttgttcgccgtaaagaagaagagaccgcaactgcgggtggtattatttaccgggcgctgcggcagaaaaaccaaatcaaggtgttgt tatctctgtgggtactggccgtattcttgataatggttcagtgcaagcgctggcggttaacgaaggcgatgttgtcgttttggtaaatactc aggtcaaaatactatcgatatcgatggtgaagaattattgatttgaatgaaagtgatatctacggcgttttagaagcttaattattacactca ctttttatttaacctacaaaatttaaggaaagatcatggctgctaaagacgtattatttggtgatagcgcacgcgcaaaaatgttggtaggt gtaaacattttagccgacgcagtaagagttaccttaggacctaaaggtcgtaacgttgttatagaaaaatcatttggtgcaccgatcatcac caaagatggtgtttctgttgcgcgtgaaatcgaattgaaagacaaattcgaaaacatgggcgcacagatggttaaggaagttgcttctca agccaacgaccaagccggtgacggcacaacgacagcgactgtactagcacaggcgattatcagcgaaggcttgaaatctgttgcgg ctggcatgaatccaatggatcttaaacgtggtattgataaagctacggctgctgttgttgccgccattaaagaacaagctcagccttgcttg gatacaaaagcaatcgctcaggtagggacaatctctgccaatgccgatgaaacggttggtcgttttaattgctgaagcgatggaaaaagt cggtaaagaaggtgtgattaccgttgaagaaggcaaaggccttgaagacgagcttgatgttgtagaaggcatgcagttcgatcgcggtt acttgtctccgtacttcatcaacaaccaagaaaaaatgaccgtagaaatggaaaatccattaattctattggttgataagaaaattgataac cttcaagagctgttgccaattcttgaaaacgtcgctaaatcaggtcgtccattattgatcgttgctgaagatgttgaaggccaagcactagc

aacattggtagtaaacaacttgcgcggcacattcaaggttgcagcggttaaagcccctggttttggcgatcgtcgtaaagcgatgttgca
agatcttgccatcttgacgggtggtcaggttatttctgaagagctagggatgtctttagaaactgcggatccttcttctttgggtacggcaa
gcaaggttgttatcgataaagaaaacaccgtgattgttgatggcgcaggtactgaagcaagcgttaatactcgtgttgaccagatccgtg
ctgaaatcgaaagctcgacttctgattacgacatcgaaaagttacaagaacgcgttgctaagcttgcgggcggcgttgccgtgattaag
gttggtgcgggttctgaaatggaaatgaaagagaagaaagaccgtgttgacgatgcacttcatgcaactcgcgcagcggttgaagaag
gtgttgttgcgggtggtggtgttgctttgattcgcgcactctcttcagtaaccgttgttggtgataacgaagatcaaaacgtcggtattgcat
tggcacttcgtgcgatggaagctcctatccgtcaaatcgcgggtaacgcaggtgctg**C**aggg**G**cag**C**ggttgttgataaagtgaaat
ctggcacaggtagctttggtttaacgccagcacaggtgagtatggcgatatgattgcgatgggtattttagaccctgcaaaagtcacgc
gttcatctctacaagccgcggcgtctatcgcaggtttgatgatcacaaccgaagccatggttgcggatgcgcctgttgaagaaggcgct
ggtggtatgcctgatatgggcggcatgggtggaatgggcggtatgcctggcatgatgtaatcactttgtgattcattgtcctgatctgctta
ccgtGTCGACATATTCAAGATAAAGATGCCTTCACTGACATCAGTCACCAACAATC
AATCAAACACCAATACCAATCGCAAAAACTCATAAAACTAGCCGATCACCAAAT
CCCAAAAGCGTTCAAAAATGAAACGAGCACGTCACACAAAATCAATTTATACGC
TAACGAACCAGGTCAAACTTATCGTTTTTTTGAGCACGTTTGTTCCACTAATGAAA
GAGAAAAGTCGTTAATTCACTGGCTTTTGGCGTATCCGCACCTTCACATAGAAAT
TAGTAATGGCATGCTACTGGCCTTTAAAAAGAATCAGTTAATTGAAGAAACCTCG
CTTATCTCAGCCATTACCGCTGTAGCCGAATTTGCGCTTATCCTCAGCCATGATTA
AACTGACGCCAATTAATATAAGACATACTAATTAATAACTCCCTTAATTGAGAAG
AATAATGAAAAACACACTCAAATCCTCATCACGTTTTAGTCTGAAACAACTCGGC
ACCGGCGCTCTGATTATCTCCAGTTTGTTCTTCGGTGGTTGCACCACAACACAACA
AGATAATTTATACACAGGGGTTATGTCTCTTGCGAGAGACAGCGCTGGCCTAGAA
GTTAAAACAGCCTCTGCCGGTGACGTCAATCTTACTTATATGGAACGCCAAGGCA
GTGACAAAGATAATGCCGAAAGCGTTATTTTATTACACGGTTTCTCTGCTGATAA
AGATAACTGGATTCTTTTTACCAAAGAATTCGATGAAAAATATCATGTTATCGCT
GTCGATTTAGCGGGACATGGCGATTCAGAACAATTATTAACGACTGATTACGGTC
TCATAAAACAAGCCGAGCGTTTAGATATCTTCTTATCTGGCTTAGGGGTTAACTC
ATTTCACATCGCCGGTAATTCAATGGGGGGGGCTATCAGCGCAATCTACAGTTTG
AGTCACCCAGAGAAAGTTAAAAGTCTTACATTGATCGATGCAGCAGGTGTCGATG
GCGATACTGAAAGCGAATACTACAAAGTTTTGGCAGAAGGTAAGAATCCTTTAAT
TGCAACTGATGAAGCAAGTTTTGAATACCGCATGGGTTTCACCATGACTCAGCCT
CCTTTCCTACCTTGGCCACTAAGACCTTCTTTATTACGTAAAACGCTAGCCCGTGC
CGAGATCAATAACAAAATTTTTTCCGATATGCTGAAAACCAAAGAACGTTTAGGA
ATGACTAACTTTCAACAGAAAATTGAAGTGAAAATGGCTCAACATCCATTGCCAA
CACTGATTATGTGGGGCAAAGAAGATCGCGTTCTTGACGTATCCGCAGCAGCGGC

CTTCAAAAAAATAATTCCACAAGCAACTGTTCATATTTTTCCTGAAGTAGGCCAC
CTACCTATGGTAGAAATTCCTAGTGAAAGCGCTAAAGTTTATGAAGAGTTTTTGT
CCTCTATTAAATAAGAGCACATAATCATGACTGACTTATAAACAGCCAAGCATTT
AAAATGCTTGGCTGTTTATTTTAATGGCCAAATTATTCAACGACCAAGCTCTGCG
GTAAAATCGCAGTGGGTTTCTTGTTTTCATCAACAGCAACAAACGTGAAATACCC
CGTAATCGCATTTTTCTGATTATCAAAATACATACTTTCCACCAGCATATTAACTT
CAACTTTTAAACTCGTCCGCCCTACCTCTATAACACTGGCAGTCAATTCGACAATG
GTACCTGCGGGAACAGGATGCTTAAAATCGATTCGATCACTGCTGACGGTTACGA
TGCTTTGTCGAGAAAAACGAGTCGCTGCAATAAAAGAAACCTCATCCATCCACTG
CATTGCAGTGCCACCGAATAACGTATCATGATGATTTGTTGTCTCTGGAAATACC
GCTTTAGAAATAGTGGTTTTTGATACGCGCTTTCGCTGCGCAATAATATCTTCTCT
GCTAAGAGTTGCGGATGGCATACATAAACTCGCTTGATTAAGATTAATAATAAAT
AGTTAACAGTATATTGAACTGAGGGTCTGAAGAACTCTAATACCTCTGAAGAACT
TTGAGGCCGCTAGAGAGAAAAGACCAGTGATAATATTTCATCTTGCCATGAGAGC
TTATCATGAAAGCCTGTGCTTAAAATCAATCATTATATTTATTCATCTTTAATTGA
AATAATACCAATATATTTCATATATAATTTCACACTACCCTTATCTCACTAGACTT
CCCGCGCATAGGCGCAAACAATCAACGCAAGTTCACAATAAAGCGGTTCGCTGC
AACACATGCCCTAGCGTCTAAAGTAGCACGCACAACACTGGCCAGTCGTACTAGC
CCCTTTGCGATTCGTGCAGACGAGCAACAAGCGCTATTAAACTTACCTAAATTTC
TAACCACCACCATTGGTTCTTTTCCACAAACTCAAAAAACTCGTCAAATCCGCTTG
CAATTTAAACGCGATGACATAGATCTAATCGATTATCAAACCCGCATTCAAGCGC
TCATTAAAAACGCACCACTGGCAAGAAGTTCTACCTGCACTGACCAATATGCAAG
CGGCGGCGGAAGAGCTGCCTTTGATCGATCAAGAAGAAGGGAGCAGCAAAGAGG
AAAACAATCAAAAAGAGGAGAGCAATCAAATAAAAACGAGTTATTGAGGATTTT
AATTTTAAAACAGGTATATTAATACCCTCTCTCGTAGTAAACAATGACTGTATTTA
CACAAAAATAAATAGAGGTATACCATGTCAAACATCTGGTTTGAAGTACCAAAG
ATTGAAGTATTAAACCGTCAAATGGAAAATACTGCCTGCAGCAACTTAGGCATTC
AAATTACAGAAATTGGCGATGATTATATCACTGGCACAATGCCAGCAGATGCACG
TACCTTCCAGCCAATGGGACTGATTCATGGCGGCTCAAATGTATTGCTGGCAGAA
ACACTGGGCAGCATGGCAGCTAACTGCTGTATTAATTTGTCTCAAGAATATTGTG
TTGGCCAAGAAATTAACGCCAACCACATACGCGGTGTTCGTTCCGGCATAGTGAC
TGGCACAGCAACGCTAGTACACAAAGGAAGAACCTCCCAGATTTGGGAAATTCG
CATCGTTAAC*GATCCAAAGAATTCAAAAAGCTTCTCGAGAGTACTTCTAGAGCGGCCG*

*CGGGCCCATCGATTTTCCACCCGGGTGGGGTACCAGGTAAGTGTACCCAATTCGCCCT*

*ATAGTGAGTCGTATTACAATTCACTGGCCGTCGTTTTAC*

**Figure 9:**

Amino acid sequence of the stabilized single ring mutant Glu460Ala/Ser462Ala/Val463Ala of Cpn60:

SEQ ID No 14: Cpn10 (nucleotides 458-751of Figure 10):

MKIRPLHDRIVVRRKEEETATAGGIILPGAAAEKPNQGVVISVGTGRILDNGSVQALA
VNEGDVVVFGKYSGQNTIDIDGEELLILNESDIYGVLEA

SEQ ID No 15: Cpn60 (nucleotides 458-751 of Figure 10):

MAAKDVLFGDSARAKMLVGVNILADAVRVTLGPKGRNVVIEKSFGAPIITKDGVSV
AREIELKDKFENMGAQMVKEVASQANDQAGDGTTTATVLAQAIISEGLKSVAAGMN
PMDLKRGIDKATAAVVAAIKEQAQPCLDTKAIAQVGTISANADETVGRLIAEAMEKV
GKEGVITVEEGKGLEDELDVVEGMQFDRGYLSPYFINNQEKMTVEMENPLILLVDKK
IDNLQELLPILENVAKSGRPLLIVAEDVEGQALATLVVNNLRGTFKVAAVKAPGFGD
RRKAMLQDLAILTGGQVISEELGMSLETADPSSLGTASKVVIDKENTVIVDGAGTEAS
VNTRVDQIRAEIESSTSDYDIEKLQERVAKLAGGVAVIKVGAGSEMEMKEKKDRVD
DALHATRAAVEEGVVAGGGVALIRALSSVTVVGDNEDQNVGIALALRAMEAPIRQI
AGNAGAAGAAAVVDKVKSGTGSFGFNASTGEYGDMIAMGILDPAKVTRSSLQAAASI
AGLMITTEAMVADAPVEEGAGGMPDMGGMGGMGGMPGMM

**Figure 10:**

SEQ ID No 16: DNA sequence of the stabilized single ring mutant Glu460Ala/Ser462Ala/Val463Ala:

In the DNA sequence:
Small letters – the Cpn10-Cpn60 coding fragment,
Big bold letters = introduced mutations

atcaaaaaatgcagcaaggacagattcctgcccaagaattagcagaaggtttcttgttagcactggccggcgctttattattaacgccgg
gttttgtcactgatgcgctgggtttacattactcgtccccgcgacgcgtaaagcgttggtccataaggtgattgcatttattaccccctc
gcatgatgactgcaagcagctttcaagcgacgggtagttttcaggaaggctcgtttaaagatgtacattcgcacactgactcgcaaagca
gtcatgaaaaaatcacaattgaaggcgaatataccaaagacgataagtaggtatttttttcggctagccgttgaaatcctagtaaaagccc
cgataaattaaccatctatttttcacagaggcaatttagcctttgtttaccttattgatcctaatacttgggatccaacagttggagagtctagc
aaatgaaaatccgtccattacatgatcgtattgttgttcgccgtaaagaagaagagaccgcaactgcgggtggtattatttttacc
gggcgctgcggcagaaaaaccaaatcaaggtgttgttatctctgtgggtactggccgtattcttgataatggttcagtgcaagcgctggc
ggttaacgaaggcgatgttgtcgttttttggtaaatactcaggtcaaaatactatcgatatcgatggtgaagaattattgatttttgaatga
aagtgatatctacggcgttttagaagcttaattattacactcacttttttatttaacctacaaaatttaaggaaagatcatggctgctaaagacg
tattatttggtgatagcgcacgcgcaaaaatgttggtaggtgtaaacattttagccgacgcagtaagagttaccttaggacctaa
aggtcgtaacgttgttatagaaaaatcatttggtgcaccgatcatcaccaaagatggtgtttctgttgcgcgtgaaatcgaattgaaagaca
aattcgaaaacatgggcgcacagatggttaaggaagttgcttctcaagccaacgaccaagccggtgacggcacaacgacagcgact
gtactagcacaggcgattatcagcgaaggcttgaaatctgttgcggctggcatgaatccaatggatcttaaacgtggtattgataaagcta
cggctgctgttgttgccgccattaaagaacaagctcagccttgcttggatacaaaagcaatcgctcaggtagggacaatctctgccaatg
ccgatgaaacggttggtcgtttaattgctgaagcgatggaaaaagtcggtaaagaaggtgtgattacgttgaagaaggcaaaggcctt
gaagacgagcttgatgttgtagaaggcatgcagttcgatcgcggttacttgtctccgtacttcatcaacaaccaagaaaaaatgaccgta
gaaatggaaaatccattaattctattggttgataagaaaattgataaccttcaagagctgttgccaattcttgaaaacgtcgctaaatcaggt
cgtccattattgatcgttgctgaagatgttgaaggccaagcactagcaacattggtagtaaacaacttgcgcggcacattcaaggttgc
agcggttaaagccccctggttttggcgatcgtcgtaaagcgatgttgcaagatcttgccatcttgacgggtggtcaggttatttctgaagag
ctagggatgtctttagaaactgcggatccttcttctttgggtacggcaagcaaggttgttatcgataaagaaaacaccgtgattgttga
tggcgcaggtactgaagcaagcgttaatactcgtgttgaccagatccgtgctgaaatcgaaagctcgacttctgattacgacatcgaaaa
gttacaagaacgcgttgctaagcttgcgggcggcgttgccgtgattaaggttggtgcgggttctgaaatggaaatgaaagagaagaaa
gaccgtgttgacgatgcacttcatgcaactcgcgcagcggttgaagaaggtgttgttgcgggtggtggtgttgctttgattcgcgcactct
cttcagtaaccgtgttggtgataacgaagatcaaaacgtcggtattgcattggcacttcgtgcgatggaagctcctatccgtcaaatcgc

gggtaacgcaggtgctg**C**aggg**G**cag**C**ggttgttgataaagtgaaatctggcacaggtagctttggttttaacgccagcacaggtg
agtatggcgatatgattgcgatgggtattttagaccctgcaaaagtcacgcgttcatctctacaagccgcggcgtctatcgcaggtttgat
gatcacaaccgaagccatggttgcggatgcgcctgttgaagaaggcgctggtggtatgcctgatatgggcggcatgggtggaatggg
cggtatgcctggcatgatgtaatcactttgtgattcattgtcctgatctgcttaccgtgtaaaaagatcaggctcaaggctgtctctataaaa
agccgtatctttgatgagtgttgtctttctgctgaaaacgacattcttggagtgcggctttttttgattttggtcataaaattcagaatattgtgta
attttatgtaactagctggcctataatgttgagttcctctgggtggcatgatctcatggtacttcacttaagcctgattcactgcg
gctttaacagtaaaataataacgcaacgtagaaacataataagcgtatggcattaatgaagacggctgcatttaattcagatc